

A NEW BURROWING CRAWFISH OF THE GENUS  
*CAMBARUS* FROM SOUTHWEST ALABAMA  
(DECAPODA, CAMBARIDAE)

J. F. Fitzpatrick, Jr.

*Abstract.*—A new burrowing crawfish *Cambarus* (*Lacunicambarus*) *miltus*, is described from Baldwin County, Alabama. It is apparently restricted in distribution, having been collected only from the type-locality despite search elsewhere in the vicinity. It is easily discernable in the field from other *Lacunicambarus* occurring in the immediate vicinity by its small size and concolorous brick-red color. Some problems in the identity of the populations of the subgenus are briefly discussed.

---

All of the recent treatments of the genus *Cambarus* (Hobbs, 1969; 1972; 1974) recognize that the subgenus *Lacunicambarus* represents a species complex rather than the two subspecies currently employed. Despite the fact that Marlow (1960) was able to find no significant morphometric variation in an examination of 1234 specimens from an undetermined number of localities extending from New Jersey and Wyoming to Texas and Florida, subsequent collectors and investigators have become convinced that a number of discrete breeding populations exist, and this apparently extensive range is really occupied by several distinct species. Among the characters which seem to indicate species identification are rostral length and width, areola length, size and proportions of the chela, and overall size. Marlow's (1960:234-236) treatment of the different color patterns as merely variants likewise seems no longer tenable; additional color patterns in the complex have been observed. Members of many populations are markedly more robust in construction than others, and geographically stable differences exist in the relative measurements of the triangle described by the anteriomesial limits of the branchiostegites. Tuberculation of the principal elements of the cheliped also seem to be distinct in different populations in specific parts of the "range." Marlow's restriction, copied in subsequent treatments, of the *ludovicianus* form to Assumption, Jefferson, Orleans, St. Bernard, St. Charles, St. Tammany, Tangipahoa, Terrebonne and Washington Parishes in Louisiana is not consistent with collections I have made in areas east of the Mississippi River. I have numerous specimens from the "Delta" region of Mississippi and extreme western Tennessee which I am unable, at present, to distinguish, on the basis of morphology or color pattern, from specimens from the vicinity of New Orleans (the type-locality). Payne and Riley (1974) also encountered this apparent enigma in the Chickasaw Basin in Tennessee. West of the Mississippi River, Reimer and his students have reported a much more extensive

range for *C. (L.) diogenes ludovicianus* Faxon, 1885 (Reimer, 1969; Reimer and Clark, 1974); he even strongly questioned the conspecificity of *ludovicianus* with *C. (L.) d. diogenes* Girard, 1852 (Reimer, 1969:53), a position I share. [Reimer does not give the depository of his specimens, but those on which Payne and Riley's conclusions are based are at Memphis State University (loc. cit.: 125) and mine are at the National Museum of Natural History, Smithsonian Institution.]

Clearly, then, the subgenus is badly in need of thorough revision, including a more intensive morphometric analysis than that offered by Marlow. Under such circumstances, one ordinarily would not describe a new species without careful examination of the interrelationships of the several species. The new species here presented, however, is so clearly distinct from other populations in the subgenus that its description offers no potential for confusing a more complete study. Its range is limited and is located in an isolated coastal area, away from other populations.

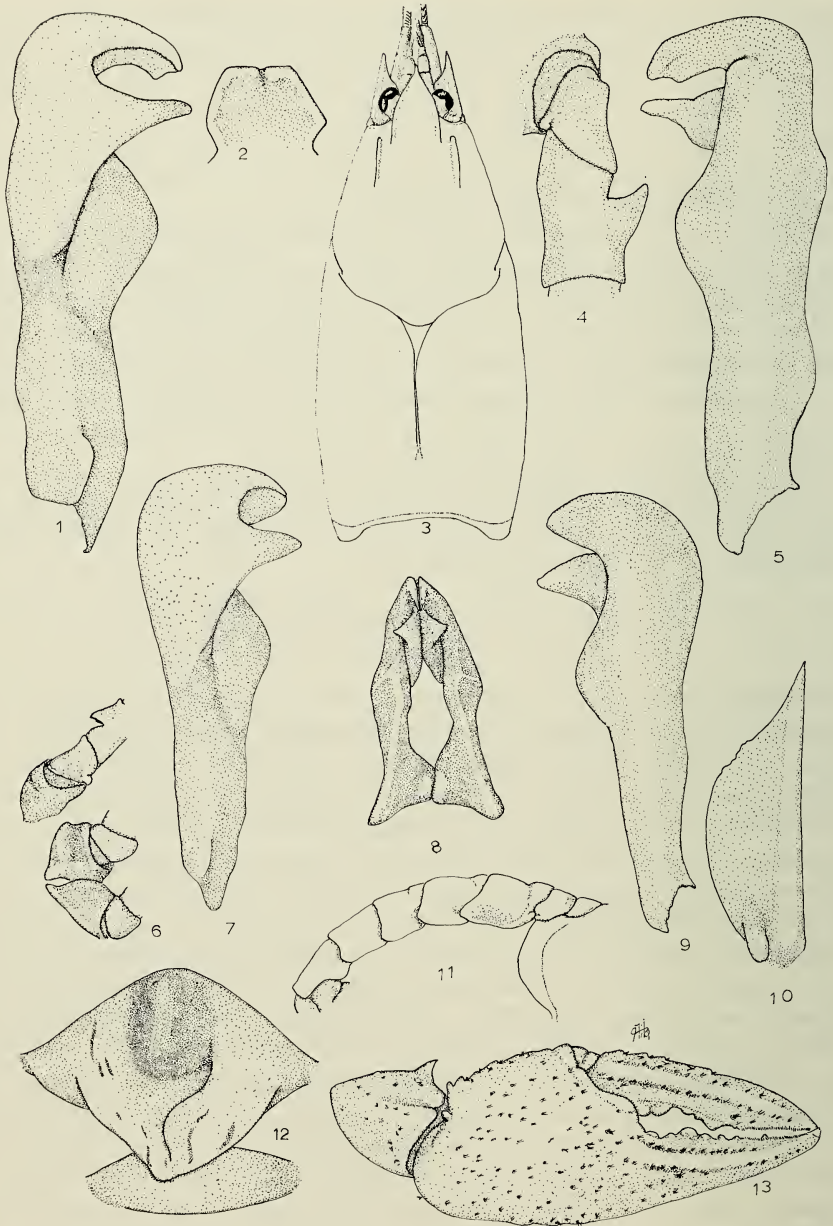
I am grateful to Ms. Barbara A. Laning and Mr. Vergil E. Lee, Jr., for help with the field work, and Dr. Horton H. Hobbs, Jr., as usual, gave unstintingly of his time and knowledge.

*Cambarus (Lacunicambarus) miltus*, new species

Figs. 1-13

*Diagnosis.*—Pigmented; eyes scarcely, if at all, reduced. Rostrum depressed, lacking marginal spines or tubercles; acumen prominent and acute but poorly delimited at base from rostrum. Areola 35.9-42.5 (avg. 39.36) percent of total length of carapace and linear. Cervical spine absent; branchiostegal spine obsolete. Suborbital angle acute. Antennal scale about 2-3 times longer than broad, widest near midlength, cephalolateral margin terminating in long, acute spine. Cephalic margin of cephalic part of epistome broadly truncate. Chela with mesial row of 5-6 tubercles, second row of 4-5 medial to it; basal half of opposable margin of movable finger with broad concavity. Hook on ischium of third pereopod only and slightly overlapping basis. Coxa of fourth pereopod with longitudinally oriented prominent caudomesial boss. First pleopod of male terminating in 2 subequal rami, both bent at angle of approximately 90° to main axis of shaft of pleopod; first form male with caudal knob at caudolateral base of central projection; subapical margin of central projection of first form male with nearly obsolete, broad, shallow notch. Annulus ventralis of female roughly subquadrangular, with deep broad cephalomedian trough; highly elevated (ventrally) posteriorly, overhanging postannular sternite.

*Holotypic male, Form I.*—Body subovate, depressed (Fig. 3). Abdomen shorter than thorax (21.8 and 24.5 mm) and narrower (7.4, 9.8 mm); carapace nearly as high as wide at level of caudodorsal margin of cervical groove (9.6, 9.8 mm). Areola 39.8 percent of total length of carapace



Figs. 1-13. *Cambarus (Lacunicambarus) miltus* (all figures of holotype, unless otherwise noted): 1, Mesial view of first pleopod; 2, Cephalic part of epistome; 3, Dorsal aspect of carapace; 4, Basis and ischium of right third pereiopod; 5, Lateral view of first pleopod; 6, Proximal podomeres of third through fifth pereiopods; 7, Mesial view

(holotype with sinistrocephalic irregularity—not illustrated—in areola, probably from molt difficulty). Rostrum depressed, sharply convergent margins with moderately well developed ridges flanked mesially by usual submarginal row of setiferous punctations; acumen acute and prominent, not sharply delimited from rostrum at base. Subrostral ridges well developed and visible in dorsal aspect to level of suborbital angle. Postorbital ridges strong, terminating cephalically in tubercles. Carapace sparsely punctate, punctations grading to widely scattered ventrocephalic granulations. Cervical spine absent; branchiostegal spine obtuse. Cephalic section of carapace 1.55 times longer than areola.

Abdominal pleura (Fig. 11) broadly rectangular in lateral aspect, none markedly expanded caudoventrally or cephaloventrally. Cephalic section of telson with one spine in each caudolateral corner. Spines associated with distal parts of both rami of uropod all tiny and subequal in size.

Cephalic lobe of epistome (Fig. 2) subtrapezoidal in outline, cephalic margin truncate, and all margins except caudal ridged; fovea of caudal lobe obtuse.

Antennae extending to second abdominal segment; antennal scale (Fig. 10) 3.17 times longer than wide, broadest near midlength, thickened lateral part terminating cephalically in long acute spine. Antennules of usual form and peduncle without spines.

Right chela (Fig. 13) depressed with palm inflated. Mesial margin of latter with row of 5 small, nearly squamous tubercles, another row of 4 similar tubercles just dorsomedial to it and pair of small tubercles ventromedial to it in distal third. Dactyl with row of 4 squamous tubercles in basal half of mesial margin and second row of 3 dorsomedial to it; opposable margin broadly excised in basal half with 4 tubercles in excision, larger tubercle beyond distal border of excision and crowded minute denticles thence to tip, denticles interrupted ventrally by small tubercle at base of distal fourth of finger. Opposable margin of immovable finger with 2 small and one prominent tubercle in basal half, distal half with 4 small tubercles, 3 near base and distalmost interrupting crowded minute denticles distal to former. Both fingers with submedian longitudinal ridge flanked by setiferous punctations above; similar ridges below, that on dactyl more prominent; upper and lower surfaces with setiferous punctations more numerous marginally than medially.

---

←

of first pleopod of morphotype; 8, Caudal view of first pleopods; 9, Lateral view of first pleopod of morphotype; 10, Right antennal scale; 11, Lateral aspect of pleura of abdomen; 12, Annulus ventralis and postannular sternite of allotype; 13, Distal podomeres of cheliped.

Carpus longer than broad with dorsally placed oblique furrow running along long axis; mesial surface with 3 or 4 small squamous tubercles and single, strong, acute spine at base of distal third; lower laterodistal and mesiodistal corners with acute spine; entire carpus sparsely punctate.

Upper surface of merus with 2 small spines distally, otherwise margin entire; lower mesial margin with row of 11 equidistant, subequal tuberculiform spines; lower lateral margin with row of 7 similar spines. Ischium with row of 3 small tubercles on mesial margin and single large tubercle at mesiodistal margin; lateral margin smooth except hook-like sufflamen articulating with large articular condyle of coxa. Basis and coxa without spinose ornamentation. Proximal 4 podomeres all very sparsely punctate.

Hook on ischiopodite of third pereopod only (Fig. 4); hook simple, extending over basis slightly. Coxa of fourth pereopod (Fig. 6) with prominent caudomedial boss oriented longitudinally. Coxae of second through fifth pereopods and sternites without dense tufts of setae.

First pleopods (Figs. 1, 5, 8) symmetrical, not markedly deflected mesially; terminating in 2 elements, both bent at angle of approximately  $90^\circ$  to main shaft of pleopod; central projection corneous, broad, subapical margin with broad, shallow, nearly obsolete notch; caudal knob at caudolateral base of central projection; mesial process non-corneous, subconical, laterally inclined. Pleopods reaching coxae of third pereopod when abdomen flexed.

*Allotypic female*.—Differing from holotype in following respects: mesial margin with only 2 rows of tubercles, mesialmost of 6 and dorsomedian one of 5; lower mesial margin of merus with 9 spines. Cephalic section of telson with 2 spines in each caudolateral corner.

Annulus ventralis (Fig. 12) subrhomboidal in outline; centrocaudal portion elevated (ventrally) and projecting over postannular sternite; centrocephalic part with deep trough divided by low longitudinal ridge; sinus originating in sinistrocaudal corner of trough and describing broadly sigmoid curve before terminating at midline anterior to caudal margin; several deep grooves on posterior and sinistrocephalic surfaces of annulus. Postannular sternite spindle-shaped, highest (ventrally) along median line.

*Morphotypic male, Form II*.—Differing from holotype in following respects: ventromesial margin of merus with row of 8 spines, ventrolateral margin with row of 5; mesialmost row of 5 tubercles on palm. Ischia of third pereopods with small tubercles at site of hooks. Both elements of first pleopod (Figs. 7, 9) non-corneous and blunter.

*Type locality*.—In burrows along d'Olide Creek under old highway 98 bridge, 0.1 mi (161 m) S of the junction of U.S. highways 90, 98, and I-10 at Spanish Fort, Baldwin County, Alabama. Numerous grasses and frontland shrubs are nearby, but most of the area under the bridge pilings is bare, or at most with a few grasses. The burrows are relatively simple, but the chamber is never directly below an opening, and 2-3 openings with small

Table 1. Measurements (mm) of types of *Cambarus (Lacunicambarus) miltus*.

	Holotype	Allotype	Morphotype
Carapace—			
length	24.5	27.5	20.1
width	9.8	11.1	8.7
height	9.6	11.5	8.6
Rostrum—			
length	4.6	4.6	3.8
width	3.3	3.8	2.7
Areola—			
length	9.6	11.7	7.6
Antennal scale—			
length	3.8	4.0	3.2
width	1.2	1.7	1.2
Chela—			
length of inner margin of palm	6.5	7.4	5.1
total length	19.6	20.5	14.2
width	8.8	9.6	7.0
dactyl length	12.5	12.5	9.0
Abdomen—			
length	21.8	24.3	18.3
width	7.4	9.6	6.6

chimneys are usual. The surface is a brick-red colored sandy clay and relatively stable, but below the water level it turns to a near slush, making excavation of the burrows difficult. Most, but not all, of the animals were captured when they came to the surface in response to agitation of the water within the burrow.

*Disposition of the types.*—The holotypic male, Form I; the allotypic female; and the morphotypic male, Form II, are in the U.S. National Museum of Natural History, Smithsonian Institution, numbers 148556, 148557, and 148558, respectively. All paratypes are topoparotypic and are likewise at NMNH: 148559 (1♂ II, 1♂ j, 1♀), 148560 (1♀, 2♀♀/ov.), 148561 (1♂ j).

*Range.*—*Cambarus (Lacunicambarus) miltus* has been collected only from the type-locality, although I have searched the environs on several occasions. I estimate that there are about 24–25 active burrows for the species at the type-locality. Three collections have been made: 2 March 1974 (1♂ I, 1♀, 1♀ j, 2♀♀/ov.), Barbara A. Laning and JFF, colls.; 24 May 1975 (1♂ j), BAL and JFF, colls.; 21 February 1976 (2♂♂ II, 1♂ j, 1♀), Vergil E. Lee, Jr., and JFF, colls.

*Variations.*—Relatively little variation was noted. The only significant differences were in the numbers of tubercles in the several rows along the mesial margin of the palm. There is less sexual dimorphism than usual in crawfishes in the morphology of the cheliped.

*Size and color.*—The allotype is the largest animal collected, and I have collected none with a carapace length of less than 17.0 mm (a female). This crawfish is a concolorous brick-red, closely matching the color of the substrate in which it lives.

*Life history notes.*—The only Form I male was collected on 2 March, and 2 of the 3 females simultaneously collected were ovigerous. The third female, the allotype, has the exuviae of recently departed young still attached to her pleopods. At this time several tiny juveniles were seen in the burrow during excavation. No signs of reproductive activity were seen during other visits, and each burrow always had a solitary inhabitant (except possibly recently independent young).

*Relationships.*—The closest relatives of this species currently bear the appellations *Cambarus* (*Lacunicambarus*) *diogenes diogenes* and *C. (L.) d. ludovicianus*. *C. (L.) miltus* is easily separated from both by the caudal knob on the first pleopod, the truncated epistome, and the deep, broad cephalomedian trough in the annulus. Further analysis of its relationships must await study of the subgenus.

*Etymology.*—The name “miltus” is taken from the Greek, *miltos*: red earth; it is given because of the brick-red color of the animal and the red clay substrate from which it was dug.

*Associates.*—One specimen of *Procambarus* (*Scapulicambarus*) *clarkii* (Girard, 1852) was taken from a burrow in the same area as *C. (L.) miltus*. *Cambarellus lesliei* Fitzpatrick and Laning (1976) was collected from flooded grassland adjacent to the type-locality. For full citation of the species not referenced here, readers should consult Hobbs (1974).

#### Literature Cited

- Fitzpatrick, J. F., Jr., and B. A. Laning. 1976. A new dwarf crawfish (Decapoda: Cambaridae: Cambarellinae) from southwest Alabama and adjacent Mississippi. *Proc. Biol. Soc. Washington* 89:137–146.
- Hobbs, H. H., Jr. 1969. On the distribution and phylogeny of the crayfish genus *Cambarus*. In P. C. Holt, R. L. Hoffman and C. W. Hart, Jr., eds. The distributional history of the southern Appalachians, Part I: Invertebrates. Virginia Polytechnic Inst., Res. Div. Monogr. 1:93–178.
- . 1972. Crayfishes (Astacidae) of North and Middle America, Identification Manual 9, x + 173 pp. In *Biota of Freshwater Ecosystems*. U.S. Environ. Protec. Agency Water Poll. Contr. Ser.
- . 1974. A checklist of the North and Middle American crayfishes (Decapoda: Astacidae and Cambaridae). *Smithsonian Contrib. Zool.* 166:iii + 161 pp.
- Marlow, G. 1960. The subspecies of *Cambarus diogenes*. *Amer. Midl. Nat.* 64: 229–250.

- Payne, J. F., and L. A. Riley. 1974. Notes on crayfishes from the Chickasaw Basin. *J. Tennessee Acad. Sci.* 49:125-128.
- Reimer, R. D. 1969. A report on the crawfishes (Decapoda, Astacidae) of Oklahoma. *Proc. Oklahoma Acad. Sci.* 48:49-65.
- Reimer, R. D., and W. J. Clark. 1974. Decapod crustaceans of the Navasota River system in central Texas. *Southwestern Nat.* 19:167-178.

Department of Biological Sciences, University of South Alabama, Mobile, Alabama 36688.